(12) UK Patent Application (19) GB (11) 2 010 095 A

(21) Application No 7847752
(22) Date of filing
8 Dec 1978
(23) Claims filed
8 Dec 1978
(30) Priority data
(31) 2754917
2824118
(32) 9 Dec 1977
1 Jun 1978
(33) Fed Rep of Germany (DE)
(43) Application published
27 Jun 1979
(51) INT CL² A61C 8/00
A61B 3/00
B23C 5/12
(52) Domestic classification
A5R DJ DN
B3K 2A3 2A4G
(56) Documents cited
GB 1423198
GB 1320655
GB 1275536
GB 1203093
GB 770696
DE 2620907A
(58) Field of search
A5R
B3K

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# (54) Dental implant

(57) A dental implant, Fig. 1, has a root in the form of a curved metal plate 1 carrying a connecting portion 5 for mounting a dental superstructure. The plate is coated with a layer 4 of a biostable polymer in which are embedded spheres of reabsorbable tricalcium phosphate partially coated with non-reabsorbable tetracalcium phosphate. The plates has holes 2 in it filled with a reabsorbable calcium phosphate 6.

When in position, the reabsorbable calcium phosphates are reabsorbed and replaced by new bone thus anchoring the implant in position.

A milling device, Fig. 9, for shaping a jawbone to receive the above implant, comprises two discs 108,109, each having an edge portion shaped to provide a concave cutting surface 110. Inserts 115 may be provided to adjust the shape of the composite cutting surface.

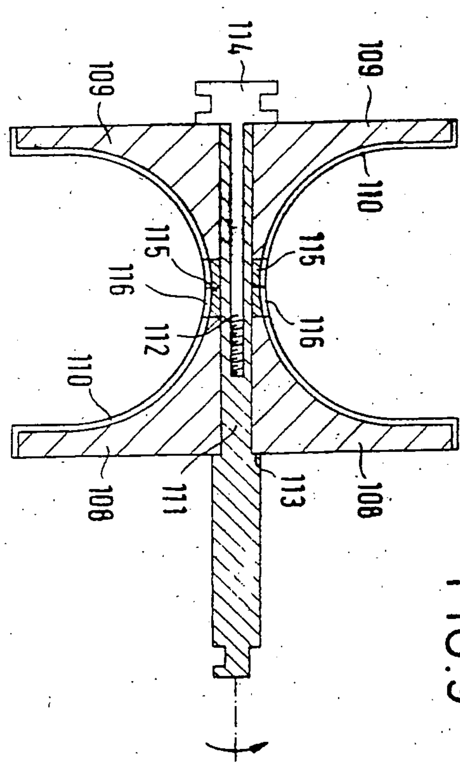


FIG.9

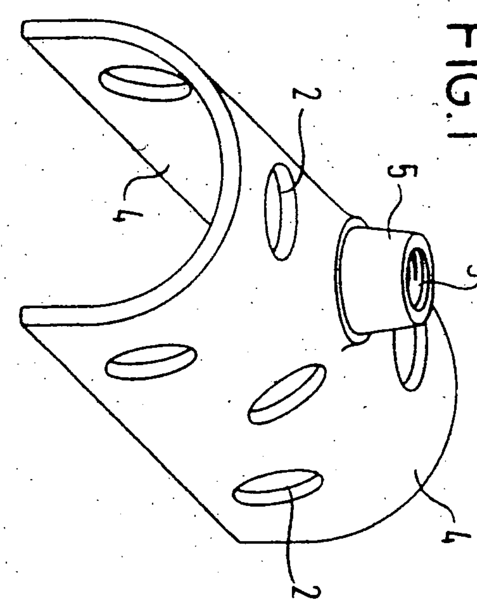


FIG.1

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FIG. 5

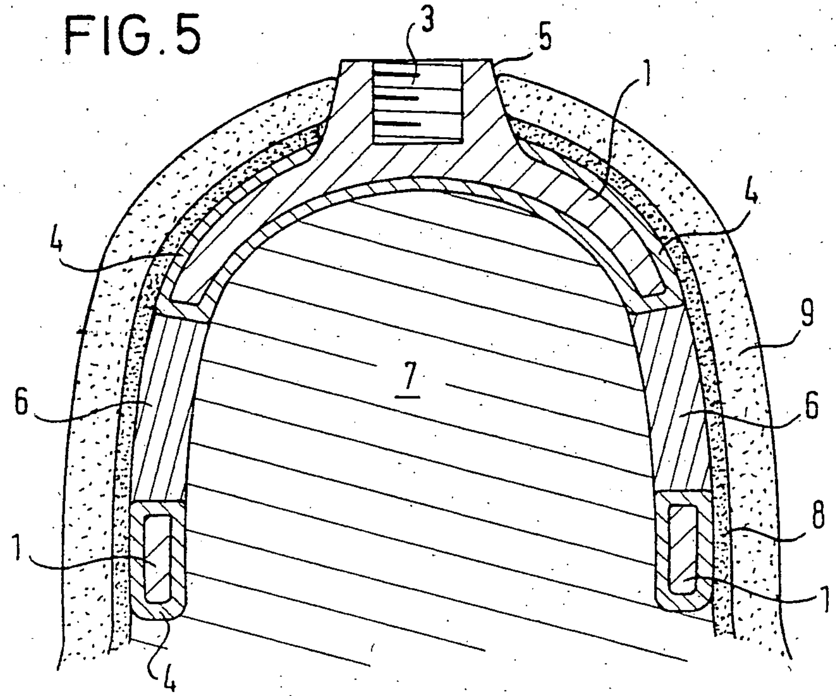



FIG. 6

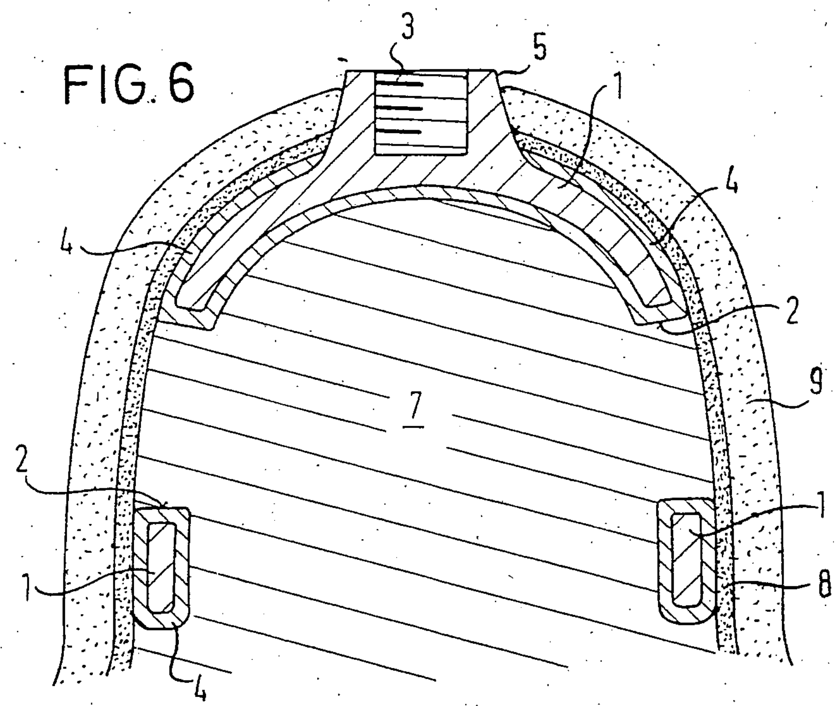
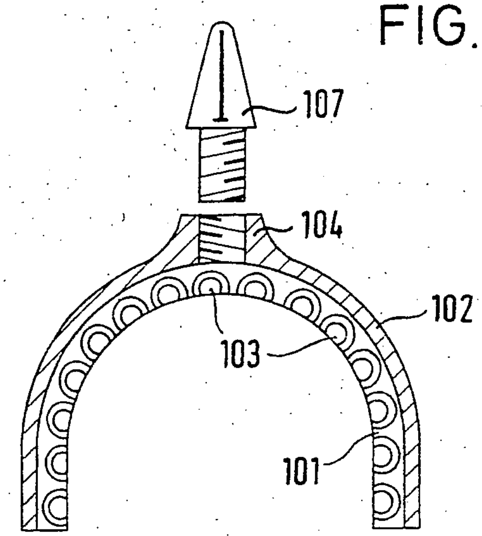


FIG. 8b



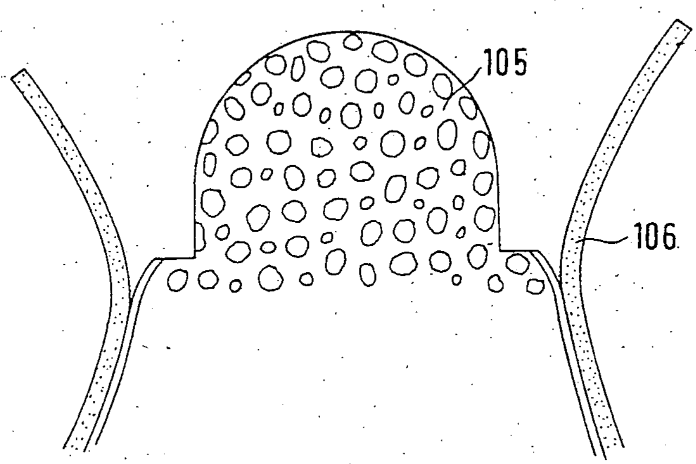




FIG. 8a

Thus use of a dental implant in accordance with the invention enables the bone to grow on to the metal plate on both sides and to grow into the holes, reabsorbing the calcium phosphate therein, and thus to anchor the implant in the jawbone without the formation of connective tissue. The biostable polymer matrix provides an anchoring compatible with human tissue for all the areas of the root coming into contact with the bone, whereby the bone tissue reabsorbs only a part of the calcium phosphate in the plastics layer and the remaining calcium phosphate which has not been reabsorbed forms a connection with the bone without connective tissue. Thus there are no special requirements for the production of the layer from the biostable plastics material and reabsorbable calcium phosphates particularly as regards the shape of the particles of calcium phosphate, since a particularly large surface is created for stable growing in of the newly formed bone tissue by reabsorption of the calcium phosphate and the mechanically stable connection between the implant and the bone is formed substantially by the bone tissue growing through the holes as it reabsorbs the calcium phosphate.

By constructing the core as a saddle-shaped metal plate provided with holes it is possible for the bone tissue to grow through the holes from the inside to the outside towards the periosteum which is removed before the implant is inserted and then replaced from the outside after the implant has been fitted onto the bone. An intimate connection is formed and the coating which surrounds the core on all sides provides an environment compatible with human tissue in which the periosteum is able to grow.

If the core is constructed as a tubular metal plate provided with holes, the calcium phosphate present in the holes is reabsorbed and the bone grows together with the inner peg of bone which is left after a tubular hole has been milled out of the bone for the insertion of the tubular implant. If the bone tissue is not such as will allow such a peg of bone to be left, then not only the holes in the implant but also the whole interior of the tubular core can be filled with reabsorbable calcium phosphate.

In a preferred embodiment the metal plate forming the core is made from titanium and the plastics layer from approximately 20% to 30% polymethylmethacrylate (PMMA) and approximately 70% to 80% sintered pulverised and finely dispersed tricalcium phosphate. Since, as has been said, there are no special requirements for the production of the layer, as is the case with the polymer matrices known up to now, as regards size and distribution of the calcium phosphate particles, the layer can be easily applied to the metal plate forming the root by immersion, spraying or painting on or the like. The surface of the metal plate may first be thoroughly cleaned by sandblasting or the like and provided with an adhesive.

The number and size of the holes can be varied as required depending upon the mechanical stability to be achieved and the quality of the bone tissue present. Also, in addition to the saddle and tubular shapes already referred to for the implant, the metal plate may have other convenient shapes which permit growing in on both sides and growing of the bone tissue through the holes.

In accordance with a further aspect of the present invention a milling device for shaping a jaw bone to receive a dental implant which is curved in section in one plane but straight in section in another plane comprises two discs whose edge affords a concave cutting surface, the discs being mounted in opposition on a common shaft coincident with the axes of the discs and affording together a concave cutting surface.

Further features and details of the invention will be apparent from the following description and certain specific embodiments which is given by way of example with reference to the accompanying drawings, in which:—

*Figure 1* is a diagrammatic perspective view of a saddle-shaped implant;

*Figure 2* is a sectional view of the implant of Fig. 1;

*Figure 3* is a diagrammatic perspective view of a tubular implant;

*Figure 4* is a longitudinal sectional view of the implant of Fig. 3;

*Figure 5* is a sectional view of an enlarged scale of an inserted saddle-shaped implant before reabsorption of the calcium phosphate;

*Figure 6* is a diagrammatic sectional view corresponding to Fig. 5 after reabsorption of the calcium phosphate;

*Figure 7* is a diagrammatic perspective view of a further embodiment of a saddle-shaped implant;

*Figure 8a* is a section of the bone milled for the implantation;

*Figure 8b* is a cross-section of the implant of Fig. 7; and

*Figure 9* is a cross-section of a milling device according to the invention for producing a mounting for saddle-shaped implants.

The implant shown in Figs. 1 and 2 is saddle-shaped and consists of a root comprising a plate 1 made from a metal compatible with human tissue, such as titanium, and provided with holes 2. The upper side of the metal plate 1 is provided with a internally threaded head which serves as a connecting portion 3 to receive connecting elements (not shown) of dental superstructures, such as crowns, bridges or the like. The metal plate 1 is covered on substantially all surfaces, including the edges of the holes 2, with a coating 4 of biostable polymeric plastics material containing embedded reabsorbable calcium phos-

and 109 in mirror-image on a common shaft 111 which coincides with the axis of rotation, a parabolically shaped cutting surface is formed. This shape of the cutting surface corresponds to the inner contact surface of a saddle-shaped implant. The milling cutters 110 are located on the inside of the parabolic surfaces. A fixing screw 112 is screwed onto the shaft pin 111. Stops 113 provided on the side of the shaft 111 connected to the drive means (on the right hand side of Fig. 9) make it possible to set up the milling device satisfactorily so that it remains correctly aligned. The screw connection 112 serves at the same time as a receptacle 114 for a guide tool. At the other end of the shaft 111 the milling device is connected to a rotary drive means (not shown). This construction makes it possible to guide the milling from both sides. The distance between the two milling discs 108 and 109 can be varied by means of ring inserts 115 which also have cutting surfaces 116 on their outer edges. This makes it possible to extend the milling cutter and thus adapt the tool to any individual case.

CLAIMS

1. A dental implant having a root in the form of a curved plate of a metal compatible with the gingiva, the plate having a connecting portion for mounting a dental superstructure, at least the surface of the plate which is to contact the jawbone carrying a layer of a biostable polymeric plastics material containing finely dispersed reabsorbable bioreactive sintered calcium phosphate.

2. An implant as claimed in Claim 1, in which the metal plate is curved in section in one plane but is straight in section in another plane.

3. An implant as claimed in Claim 1 or Claim 2 in which the metal plate is of saddle shape adapted to straddle the ridge of a jawbone after suitable milling, and carries the connecting portion on its upper surface.

4. An implant as claimed in Claim 1 or Claim 2 in which the metal plate is in the form of a tube of which one end, referred to as the upper end, is closed and carries the connecting portion.

5. An implant as claimed in Claim 4, in which the metal plate is provided with a plurality of holes into which the jawbone may grow.

6. An implant as claimed in Claim 5 in which the holes are filled with reabsorbable sintered calcium phosphate.

7. An implant as claimed in any one of the preceding Claims in which the metal plate carries the layer of plastics material with calcium phosphate on all of its surfaces with the exception of that of the connecting portion.

8. An implant as claimed in any one of the preceding Claims in which the calcium phosphate in the biostable plastics material comprises tricalcium phosphate in the form of substantially spherical or part spherical particles, the particles being covered with a layer of substantially non-reabsorbable sintered tetracalcium phosphate on the surface remote from the outer surface of the implant.

9. An implant as claimed in Claim 8 in which the particles of tricalcium phosphate are disposed only in the outer surface region of the biostable polymeric plastics material.

10. An implant as claimed in any one of the preceding Claims in which the metal plate is made of titanium and the layer of plastics material with calcium phosphate comprises about 20% to 30% polymethylmethacrylate and about 70% to 80% sintered and pulverised tricalcium phosphate.

11. An implant as claimed in any of the preceding Claims in which the surface of the plate is cleaned by sandblasting and provided with an adhesive.

12. An implant as claimed in Claim 6 or any subsequent Claim when dependent on Claim 6 in which the calcium phosphate in the holes is in the form of preformed tablets introduced into the holes.

13. A dental implant substantially as described herein with reference to Figs. 1, 2, 5 and 6, Figs. 3 and 4 or Figs. 7 and 8 of the accompanying drawings.

14. A milling device for shaping a jawbone to receive a dental implant which is curved in section in one plane but straight in section in another plane, comprising two discs whose edge affords a concave cutting surface, the discs being mounted in opposition on a common shaft coincident with the axes of the discs and affording together a concave cutting surface.

15. A device as claimed in Claim 14 in which the distance between the two discs is variable, the device including one or more ring inserts between the two discs having cutting surfaces on their outer edges.

16. A device as claimed in Claim 14 or Claim 15 including means for receiving a guide tool carried by the shaft remote from the end adapted for connection to a drive means so that milling can be guided at both ends of the shaft.

17. A milling device substantially as herein described with reference to Fig. 9 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon) Ltd.—1979.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.